Government of
Saskatchewan

Annual Report
1988-89

Saskatchewan
Energy and Mines

for the fiscal year ending
March 31, 1989

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Letter of Transmittal

The Honourable Sylvia Fedoruk
Lieutenant-Governor
Province of Saskatchewan

Dear Madame:

I have the honour to submit herewith the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1989.

Respectfully Submitted,

Honourable Patricia A. Smith
Minister of Energy and Mines

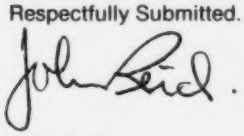
Letter of Transmittal

The Honourable Patricia A. Smith
Minister of Energy and Mines
Province of Saskatchewan

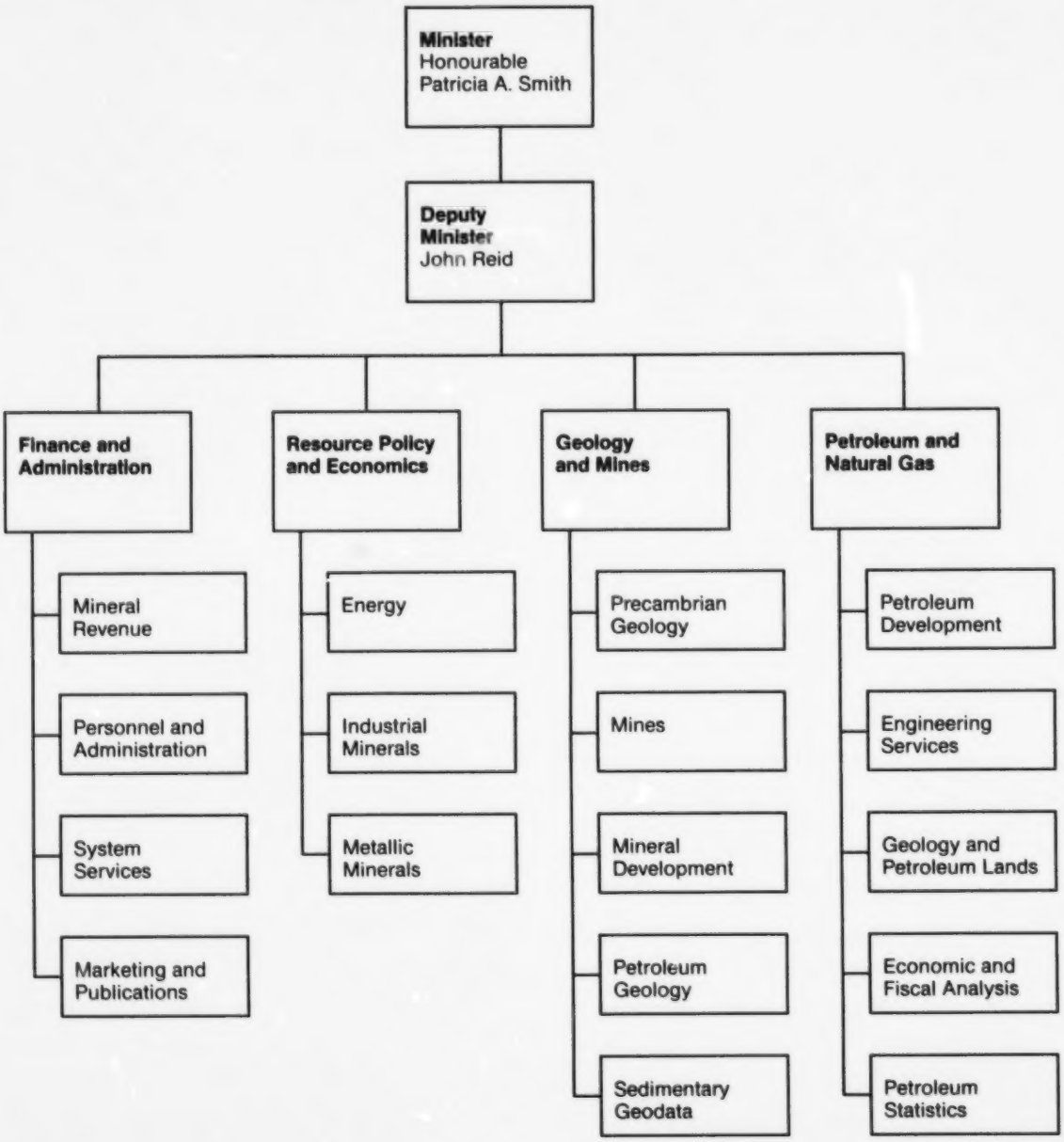
Dear Minister:

I have the honour to submit for your consideration, the Annual Report of Saskatchewan Energy and Mines for the fiscal year ending March 31, 1989.

Respectfully Submitted.



John Reid
Deputy Minister
Saskatchewan Energy and Mines


Minister
Honourable
Patricia A. Smith
Deputy
Minister
John Reid
Finance and
Administration
Resource Policy
and Economics
Geology
and Mines
Petroleum and
Natural Gas
Mineral
Revenue
Personnel and
Administration
System
Services
Marketing and
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Engineering
Services
Geology and
Petroleum Lands
Economic and
Fiscal Analysis
Petroleum
Statistics

Finance and Administration Division

Ray Clayton
Assistant Deputy Minister

The Finance and Administration Division is responsible for mineral revenue collection and audits, internal administration and personnel, legislative co-ordination, mineral rights, system services, marketing and publications.

The Finance and Administration Division is composed of four branches:

- Mineral Revenue
- Personnel and Administration
- System Services
- Marketing and Publications

Mineral Revenue Branch

The Mineral Revenue Branch is responsible for collecting, recording and accounting for the various resource revenues owing to the province and for maintaining mineral land ownership records. The branch:

- ensures that revenues and accompanying returns and reports are received when due;
- assesses certain kinds of resource revenues on an annual or periodic basis;
- assesses interest and/or penalties on late payments and overdue returns;
- processes revenues through computer and manual systems, as input to financial and management information reports;
- audits resource companies to ensure compliance with taxation legislation;
- maintains historical records of all resource revenues received by the department;
- prepares and registers all mineral land transfers to the Crown through forfeiture and voluntary transfer;
- interprets and verifies mineral land ownership for various branches of the department and for industry;
- maintains a mineral land record of all Crown and freehold mineral ownership, which includes an up-to-date record of all Crown mineral land dispositions in the surveyed area of the province;
- verifies Crown mineral lands available for Crown mineral land disposition sales;
- maintains an up-to-date computerized landfile with data identifying all completed, producing and expired oil and gas wells in the province;
- prepares special reports for use by department officials;
- informs the resource industry of its responsibilities under existing legislation and changes thereto; and
- maintains close liaison with other branches of the department on revenue and mineral ownership matters.

This branch is divided into two sections; revenue processing and revenue monitoring. Revenue processing is responsible for maintenance of the taxroll; receiving and recording of revenue; verification and processing of revenue returns; billing of various royalties, rentals and taxes; taxpayer information and assistance relating to resource taxation legislation, requirements and procedures; maintenance of computer systems and their interface with other department and government systems; processing and payment of incentive grants, compensation payments and payments to holders of trust certificates; and maintains records of all Crown and freehold mineral ownership; verifies Crown mineral lands available for Crown mineral land disposition sales; verifies mineral land ownership for every well that is licensed; maintains a taxable freehold land ownership base for purposes of mineral rights tax assessment.

Revenue monitoring is responsible for office and field audits in all resource revenue areas, follow up of delinquent returns, collection of accounts receivable and informing taxpayers of resource taxation legislation.

The main objectives of the branch are to ensure that resource revenues owing to the province are received when due, that the amounts paid are correct and properly accounted for, that data is available on a regular and accurate basis for preparation of financial reports, and that a mineral land record of all Crown and freehold land is maintained. To attain these objectives, the branch is committed to a continuous program of review and improvement to existing systems and procedures, or to the development of new systems.

Other objectives include continued and improved communication with taxpayers and the resource industry, greater involvement in policy decisions affecting resource revenues, and training and upgrading of staff to improve the branch's efficiency.

Legislation

The Mineral Revenue Branch administers the revenue provisions of numerous acts, regulations and agreements. Among the more significant are:

The Mineral Resources Act, 1985

The Petroleum and Natural Gas Regulations, 1969

The Oil and Gas Incentive Regulations

The Mineral Dispositions Regulations, 1986 including Uranium Royalties

The Delayed Payment Charges Regulations, 1970

The Oil Well Income Tax Act and Regulations

The Freehold Oil and Gas Production Tax Act and Regulations

The Mineral Taxation Act, 1983
- The Freehold Coal Production Tax Regulations
- Regulations pertaining to Mineral Rights Tax

The Crown Minerals Acts, 1985

The Potash Resource Payment Agreement

The Builders' Lien Act

Revenues

A decrease of 22.5 per cent in total resource revenues was experienced during this fiscal year. Decreases in oil and gas, uranium and other minerals exceeded the 96 per cent increase in potash revenue. Total revenue during 1988-89 amounted to $362.1 million, a decrease of $104.3 million over 1987-88.

Source of Revenue	1988-89	1987-88	Per cent Increase (Per cent Decrease)
Heritage Fund			
Oil and Gas	$224,199,015	$369,439,481	(39.3)
Potash	96,080,234	48,899,530	96.4
Uranium	17,517,321	19,717,516	(11.2)
Other Minerals	17,738,643	20,437,841	13.2
Total	$355,535,213	$458,494,368	(22.5)
Consolidated Fund			
Mineral Land Tax	$ 5,629,383	$ 5,917,236	(4.9)
Interest and Penalty	11,055	19,774	(44.1)
Sales, Services, etc.	330,681	310,846	6.4
Receipts from other Governments	574,000	1,695,000	(66.1)
Total	$ 6,545,119	$ 7,942,856	(17.6)

Incentives and Compensations

Payments under The Oil and Gas Incentive Regulations totalled $11,165,385 compared to $14,241,690 in 1987-88. Compensation payments to former mineral owners were $2.5 million in 1988-89 compared to $2.3 million paid in 1987-88.

Certain mineral rights surrendered to the Crown were encumbered by gross royalty trust certificates. As these lands are leased and brought into production, the branch pays the applicable gross overriding royalty. Payments in 1988-89 totalled $70,196 compared to $114,665 in 1987-88.

Personnel and Administration Branch

The objective of this branch is to facilitate the delivery of department programs by providing a variety of personnel and administrative services to department staff. Specific areas of responsibility include:

- **Human resource management**
  The planning, organizing and implementing of personnel activities related to the recruitment and selection of staff, classification, staff development, employee relations, co-ordination of employment equity policies, administration of government policies and the processing of all personnel transactions, are handled by this branch.
- **Financial management**
  The branch assists in the development of a department budget strategy and manages the processing of all financial transactions, preparation of financial statements, forecasting of expenditures and budget control. Specific processing activities are handled on a daily basis by the accounts group. Total department expenditures for 1988 - 89 were $12,252,578.90.
- **Property and procurement control**
  Through the purchasing section, all equipment, furniture and supplies are purchased and delivered, a central stockroom is maintained, office space is acquired or changed and physical moves are undertaken. Other activities include: acquisition and control of equipment and supplies, print procurement, and rental of photocopiers.

System Services Branch

System Services provides planning, management, consulting, and co-ordination support functions for the development, maintenance, and operation of information systems for the department. This includes responsibility for the evaluation and acquisition of computer hardware and software, data-entry, data security, word processing co-ordination and support, and the development and management of the department's computer services budget.

System analysis, development, and maintenance are performed by branch staff or co-ordinated with consultant services. The department currently runs 18 computer systems on a regular production basis.

The automated systems use a variety of equipment and computers. The branch operates a remote job

entry terminal that provides the communications link between the department and Westbridge computers. In addition, on-line terminals and micro computers are available for on-line data processing, program development and maintenance.

Major accomplishments were:

- Implementation of a micro computer network.
- Completion of the Conceptual Design and the start of the development for a Production and Disposition System.
- Completion of a Department Strategic Technology Plan.

Marketing and Publications Branch

The Marketing and Publications Branch is responsible for providing up-to-date, accurate, technical data to the oil, gas and mining industry. Sales of technical materials totalled $245,666.00 in 1988 - 1989.

This branch also prepares and distributes information on Saskatchewan resources to the public and for the use of students and teachers. In the last fiscal year staff responded to an average of 200 requests per month for general information on Saskatchewan resources.

Other responsibilities include a daily newspaper clipping service for the minister's office and senior management, as well as a resource library for use of staff and industry.

Resource Policy and Economics Division

Pat Youzwa
Assistant Deputy Minister

The Resource Policy and Economics Division conducts research and analysis of policy issues related to energy and mineral resource development. Information and recommendations are provided to government for the formulation of policies respecting such matters as: rate of development of the province's energy and mineral resources; pricing and taxation of resources; market access and development; research, development and demonstration activities; and nonconventional and renewable energy resources. The division also negotiates with the federal government and other provincial governments on issues of mutual concern in the mineral and energy sectors.

Specific objectives of the Resource Policy and Economics Division are to:

- Monitor and analyse the energy and mineral resource markets, industry structure, government policies in other jurisdictions and comparative fiscal systems, to provide informed assessments for senior management on emerging issues and industry performance.
- Review, modify and develop appropriate policies, strategies and fiscal instruments for the energy and mineral sectors.
- Produce timely and accurate long-term forecasts of production, sales, price, royalty revenue, employment and investment in the energy and mineral sectors for policy development, macro-economic forecasting and fiscal planning purposes.
- Negotiate major federal/provincial fiscal issues and arrangements.
- Develop and manage royalty and tax systems for the industrial and metallic mineral resources of the province in order to maintain a balance between a fair economic return to the province and incentives to industry.
- Maintain an awareness of technology issues, problems and opportunities and consequently, develop policies and strategies that will lead to the more cost-effective and efficient recovery and utilization of our mineral and energy resources.
- Design and deliver appropriate research, development and demonstration funding programs for the fossil fuel sector and tax incentives for the mineral sector.

The Resource Policy and Economics Division was re-organized effective February 1, 1989. Three new branches were created enabling the division to carry out its mandate more effectively and efficiently. These are Energy Branch, Industrial Minerals Branch and Metallic Minerals Branch.

Energy Branch

The main functions of the Energy Branch are to:

- conduct strategic, market and economic analysis for the development of the province's fossil fuel resources, primarily heavy oil, coal and natural gas;
- participate in federal/provincial negotiations on issues of joint interest in the energy sector;
- develop policy options to address problems and opportunities in energy resource development and taxation;
- prepare and co-ordinate economic and revenue forecasts for the energy sector; and
- plan and implement various funding programs to promote research, development and demonstration initiatives related to petroleum and lignite.

To fulfill these responsibilities, the Energy Branch consists of the staff and other resources of the former Technology Branch and relevant portion of the former Policy Analysis Branch. The Energy Branch is structured to comprise a Policy Section and a Technology Section.

Policy Section

Oil

The oil related activities of the Policy Section of the Energy Branch in 1988-89 centered around the following issues:

- Further exploratory work in the development of the Saskatchewan oil supply curve prepared by the Canadian Energy Research Institute. The model predicts future drilling and production levels based not only on economic variables, but also on the geological potential.
- Barriers to free trade with the United States are continually monitored by the branch. With low oil prices, several attempts were made in the United States to introduce legislation to impose an oil import fee. The U.S. '232' action under review during 1988 did not lead to trade sanctions. The Superfund and Customs Users Fees are considered by GATT to be inconsistent with free trade but action in the U.S. to remedy discrimination has not yet occurred.
- Takeovers of Canadian oil and gas companies by foreign companies are reviewed by the branch to facilitate Saskatchewan Trade and Investment's assessment of the impact on Saskatchewan.
- The branch participated in a study of retail gasoline prices and margins across Canada in support of the annual Energy Ministers Meeting.

Natural Gas

The Policy Section of the Energy Branch was instrumental in developing natural gas deregulation policies for Saskatchewan and continues to monitor and evaluate the impact of these policies.

The Canadian natural gas sector continues to go through a period of transition and restructuring as a result of implementation of the Agreement on Natural Gas Markets and Prices signed in October, 1985. The intent of the agreement was to reduce significantly the degree of government regulation of natural gas markets allowing prices to be determined through negotiation between buyers and sellers and giving producers and consumers access to competitive markets. Throughout 1988-89, the Policy Section of the Energy Branch participated in the Gas Monitoring Committee which represents all signatory governments to the agreement.

The impact of the deregulation initiatives has been substantial. A major expansion of the natural gas industry in Saskatchewan is underway.

- Land sale activity in gas prone areas, an early indicator of prospective development, grew from $4.4 million in 1986 to $13.0 million in 1988. A record level of 742 exploration and development wells were drilled and completed in 1988.
- New reserves continue to exceed production.
- Production of marketable natural gas of 141 billion cubic feet in 1988 exceeds the 1987 level of 96 billion cubic feet.
- Consumers have access to more reasonably priced natural gas.
- Crown revenues have increased to over $30 million.

The Policy Section of the Energy Branch administers both the gas removal and the gas use permits. One hundred and nine removal permits were issued to 25 producers. Ninety seven gas use permits were issued to 84 Saskatchewan consumers buying from 16 different producers.

Coal

The coal related activities of the Policy Section of the Energy Branch in 1988-89 centered around the following issues:

- Major review of coal royalties and taxes to evaluate the compatibility of the existing system with the changing market environment. The review included evaluating the performance of the existing system in the past and conducting a detailed study of current market trends as well as future opportunities and constraints in the domestic and external markets.
- The branch completed a research paper titled "Production and Utilization of Coal in Saskatchewan" for inclusion in the book "Geology and Utilization of Fort Union Lignites" being compiled by the U.S. Geological Survey.
- Economic and revenue forecasts for the coal industry are regularly done by the branch in response to requests from the Executive Council and the Department of Finance. From time to time the branch also undertakes a study of special policy issues raised by the industry.

Technology Section

The objective of the Technology Development Section is to enhance the production of Saskatchewan's fossil fuel resources through the development and application of innovative technology. The Technology Section facilitates research, development and demonstration (r, d & d) projects involving technologies which will permit cheaper, more effective development of our large petroleum and lignite resources. The development of better technologies will increase resource development activity which, in turn, will create significant economic benefits for Saskatchewan.

To accomplish its objective, the Technology Development Section provides financial support to desirable fossil fuel r, d & d projects under the terms of the Saskatchewan Fossil Fuels Technology Development Program. In addition to implementing this Program, the section also monitors r, d & d activities in Saskatchewan, across Canada, and in other countries to retain a current, informed perspective regarding new fossil fuel technologies. The section also advises the department regarding alternative energy and energy conservation issues.

The Saskatchewan Fossil Fuels Technology Development Program

Saskatchewan is a major fossil fuel producing region, with large petroleum and lignite reserves. However, the unconventional nature of these resources limits our ability to develop many of them using current technology.

Most of Saskatchewan's petroleum reserves consist of viscous, heavy crude which is difficult to produce, transport and refine. Much of the heavy crude lies in thin, unconsolidated sand reservoirs which are underlain by water. Because of these factors, only five per cent of the heavy oil in the reservoir can be produced by primary recovery techniques.

In contrast, Saskatchewan's lignite reserves include several large, easily mined deposits, but the lignite is of relatively low quality due to high moisture content, high ash content and low energy value. As a result, the economic value of the lignite is low, its market is relatively limited, and the lignite cannot be economically transported over long distances. Utilization of Saskatchewan lignite is primarily restricted to thermal electrical power plants located close to the mine sites.

The Saskatchewan Fossil Fuel Technology Development Program is a five year, $11.1-million program which was established to develop the new technologies that are required to reduce the technical constraints to the successful exploitation of these fossil fuel resources.

In 1988-89, the program's major accomplishment was the signing of an agreement between Saskatchewan Energy and Mines, CS Resources Limited and Saskoil for the Winter Field Horizontal Well Project. This project will involve the drilling of five horizontal wells in a heavy oil pool which cannot be economically produced by conventional vertical wells because of the large amount of water which is produced. The project is important because it may demonstrate a method of economically recovering heavy oil from low quality reservoirs which could improve the heavy oil industry's viability and competitiveness. The project will involve a total investment of over $4.3 million.

Other Technology Initiatives

The Technology Section represents Saskatchewan on the Intergovernmental Secretariat which was established by the Action Committee on Western Canadian Low-Sulphur Coal to Ontario. The Action Committee includes Canada's Deputy Prime Minister and the Premiers of Ontario, Saskatchewan, Alberta and British Columbia. The Action Committee is investigating means of improving the competitiveness of western Canadian coal in the Ontario market through initiatives which are co-operatively supported by the Action Committee and the private sector. Saskatchewan is acting as the lead government on two technical proposals addressing low rank coal upgrading. The federal government, Ontario, Alberta and five companies are participating in these initiatives.

The Technology Section has responsibility for completing the implementation of The Canada-Saskatchewan Heavy Oil Agreement and The Canada-Saskatchewan Heavy Oil/Fossil Fuels Agreement. These federal/provincial agreements expired as of March 31, 1988, but a limited amount of funding was set aside for allocation in 1988-89 and 1989-90 to complete several outstanding project commitments. The major accomplishment of these programs in 1988-89 was the initiation of steam injection at the Tangleflags North Horizontal Well Project operated by Sceptre Resources Limited. The project's performance has met Sceptre's expectations as oil production rates have exceeded 100 cubic metres per day. By December 31, 1988, cumulative production had reached 10,000 cubic metres, some 33 per cent higher than reservoir models had predicted. It is expected that peak oil production levels of 160 cubic metres per day will be reached during 1989. Depending on the continued success of the pilot and prevailing crude oil prices, Sceptre Resources and its partner Murphy Oil Co. Ltd. will consider undertaking commercial scale development at the pilot project site during 1990.

The Technology Section represents Saskatchewan on the Task Force on Energy and the Environment which was established to review the effects on the energy sector of the recommendations of the Conference on the Changing Atmosphere (Toronto June, 1988) and to assess the implications for Canada should any of the key recommendations be implemented. The task force will report to the federal, provincial and territorial energy ministers in 1989.

In 1988-89 the Technology Section of the Energy Branch provided over $758,000 in funding to the following 13 projects:

- Feasibility Study of the Design and Economics of a Shaft for the Recovery of Heavy Oil.
- The Amflo Pilot Project.
- Boundary Dam CO Pilot Plant.
- Micro-FTIR and UV-Fluorescence Spectroscopy of Coal.
- Pyrolysis and Oxidation of Saskatchewan Heavy Oils.
- Coal-Water-Fuel Product Testing.
- Potential Environmental Effects of Drilling Fluids on Crops and Soils in Saskatchewan.
- Winter Field Horizontal Well Project.
- Resource Evaluation Study of Saskatchewan Lignites.
- Optimization of Integrated Gasification Combined Cycle with Hydrogen and Carbon Dioxide Co-Production.
- Demonstration of Lignite Upgrading for Liquefaction.
- Horizontal Drilling Systems Study.
- Reduction of Energy Related Atmospheric Greenhouse Gas Emissions.

Further information is available from the Technology Section regarding the Saskatchewan Fossil Fuels Technology Development Program and concerning the projects which have been funded by the section.

Industrial Minerals Branch

The main functions of the Industrial Minerals Branch are to:

- undertake strategic, market and economic analyses for the development for the province's industrial mineral sector, primarily potash;
- develop policy options to address problems and opportunities in industrial mineral sector;
- design and implement royalty and tax systems for the production of industrial minerals including responsibility for legislation and regulations;

- design and implement incentive programs to support industry's efforts in market development and research and development; and
- prepare economic and revenue forecasts for the industrial minerals sector.

The Industrial Minerals Branch consists of staff and other resources of the relevant portions of the former Policy Analysis Branch and Fiscal Management Branch.

During 1988-89, members of the Industrial Minerals Branch:

- prepared and updated long term forecasts of world potash markets;
- developed revenue forecasts of the industrial mineral sector for fiscal budgeting and planning purposes;
- prepared monthly analyses of potash markets and Saskatchewan industry performance for senior management and ministerial use;
- conducted a market development study of Brazil that recommended ways that government and industry can improve Canada's position in this potash market;
- organized individual trips to the Far East by the Premier and the Minister, where they met with ministers and senior officials responsible for potash purchasing and usage;
- served as technical advisors to Saskatchewan Department of Education on a video about the potash industry;
- developed a model for financial analysis of a new potash mine in Saskatchewan, and
- continued to administer the market development, and research and development incentive program.

The Industrial Minerals Branch also continued activity to replace the Potash Resource Payment Agreements (PRPA) which provide for the payment of taxes by potash producers. Consultations with the industry resumed in 1988-89 with the intent to develop a new tax system specified in legislation and regulations. The PRPA agreements were extended for six months pending the outcome of consultations.

During the year the branch continued to review royalty regimes for other industrial minerals and worked closely with the Mineral Revenue Branch to resolve questions arising from the administration of the taxes and royalties payable by the producers of industrial minerals in the province.

Metallic Minerals Branch

The main functions of the Metallic Minerals Branch are to:

- conduct strategic, market and economic analyses for the development of the province's metallic mineral sector, primarily uranium and gold;
- develop policy options to address problems and opportunities in metallic mineral development;
- develop provincial positions and negotiate with the federal and other provincial governments on metallic mineral matters;
- design and implement royalty and tax systems for the production of metallic minerals including responsibility for legislation and regulations;
- review sales contracts to ensure fair market value is received for Saskatchewan uranium; and
- prepare economic and revenue forecasts for the industrial minerals sector.

The Metallic Minerals Branch consists of staff and financial resources from the relevant portions of the former Policy Analysis Branch and Fiscal Management Branch.

Principal activities of the Metallic Minerals Branch in 1988-89 included:

- monitoring of the provincial, national and international uranium industry;
- evaluation and analysis of policy and international uranium market issues and trends.
- development and updates of long term market and revenue forecasts; and
- analysis and advice to government regarding a broad range of uranium and nuclear related issues of general concern to the Saskatchewan public.

During 1988-89 the branch continued consultations with the Saskatchewan uranium industry regarding uranium royalty regulations. A paper outlining conceptual royalty alternatives was presented to industry, and consultations on royalty changes appeared likely to be concluded during the following fiscal year.

Geology and Mines Division

Les Beck
Executive Director

The division is responsible for the maintenance of the departmental geoscience data base; storage and synthesis of exploration, mining and production data submitted by industry; and disposition of all Crown minerals other than petroleum, natural gas, oil shales and helium.

The principle role of the division is to promote exploration and development opportunities for the petroleum and mineral industries in the province through publications, technical data-bases, core collections, symposia, open house meetings and by responding to direct inquiries from industry and the general public.

The responsibilities of the division are undertaken by five branches; Precambrian Geology, Sedimentary Geodata, Petroleum Geology, Mineral Development and Mines, together with a Support Services Section which carries out cartographic drafting and editorial duties for the division and provides general drafting services for the department.

The five year Canada-Saskatchewan Mineral Development Agreement terminated on March 31, 1989. This program has been the main source of funding for the division's geological mapping and mineral deposit studies which have been focussed in the triangle of country between La Ronge, Reindeer Lake and Flin Flon, in order to assist industry in its search for precious metal deposits. During the period of the program, industry's expenditures on gold exploration escalated from $6 million in 1984 to $55 million in 1988, two gold mines were brought into production and several other properties were in advanced stages of exploration. At the end of the fiscal year the federal government had made no commitment towards a new Mineral Development Agreement.

Support Services Section

The Support Services Section handles the editing and production of all geoscientific reports and maps published by the division and, in addition, provides drafting services to the rest of the department. The section consists of two working units: Survey Drafting and General Drafting.

The Survey Drafting Unit prepares thematic monochrome and colour maps and text figures to the plate-ready stage. These include compilation bedrock geology and metallogenic maps at 1:250,000 scale, outcrop geology and contour maps at various scales, stratigraphic cross-sections, and small size maps and figures for inclusion in reports and externally published scientific papers. During the fiscal year, the unit produced five publications comprising 376 pages and 18 maps and reprinted one report and a brochure. In addition, approximately 25 per cent of the cartographic staff's time was spent on special projects such as text figures for magazine articles and papers in scientific journals, slides for conference presentations, graphics for conference displays and promotional material for the department, such as the publication "Stone in Saskatchewan".

A desk-top publishing system and laser printer were used successfully to produce the annual Summary of Investigations at a high level of quality, as well as in the production of one open file report.

The General Drafting Unit maintains the mineral disposition maps, petroleum well location maps, petroleum pool boundary maps and potash and coal lease maps. They also prepare the maps for the quarterly Petroleum Land Sale, produce an annual update of the Mineral Development Map, prepare numerous text figures, slides and graphics for all areas of the department, and handle all small blueprint orders for internal use and for sale through the Marketing and Publications Branch.

In response to the staking rush north of Prince Albert thirty one 1:50,000 and two 1:250,000 scale Mineral Disposition Maps were added to the department's inventory.

1988/89 Publications

Broughton, P.L. (1988): Formation of Tertiary coal basins in southern Saskatchewan; Sask. Energy Mines, Open File Rep. 88-1, 53p.

Macdonald, R., ed. (1988): Summary of Investigations 1988, Saskatchewan Geological Survey; Sask. Energy Mines, Misc. Rep. 88-4, 242p (plus 15 maps).

MacDougall, D.G. (1988): Metallogenic Map Series, Wollaston Lake, NTS Area 64L; Sask. Energy Mines, Rep. 254, 40p (with 1:250,000 scale map).

Scott, B.P. (1988): Metallogenic Map Series, Lac La Ronge, NTS Area 73P/73I; Sask. Energy Mines, Rep. 255, 29p (with 1:250,000 scale map).

Slimmon, W.L., Sibbald, T.I.I. and Thomas, M.W. (1988): Compilation Bedrock Geology, Mudjatik, NTS Area 74B; Sask. Energy Mines, Rep. 244 (1:250,000 scale map with marginal notes).

Precambrian Geology Branch

The role of the Precambrian Geology Branch is to compile and maintain an ongoing inventory and to produce models of the regional and mineral deposit geology, geochemistry and related geoscience data for the northern Precambrian Shield region and other subsurface Precambrian rocks in the province. The information, which is produced in reports, maps, data files and through presentations and consultations, is used primarily to attract and assist mineral exploration industry working in province, and also supports other development and diversification programs. The section interfaces strongly with the Mineral Development Branch in these activities.

The geoscience program was funded in 1988-89 under the final year of the subsidiary Canada-Saskatchewan Mineral Development Agreement (MDA) of the Economic and Regional Development Agreement ERDA 1984-1989. This program has been aimed principally at stimulating and assisting the mineral exploration industry to explore for and develop gold and precious metal mines in northern Saskatchewan. The program had a total budget over five years of approximately $6 million, split 50:50 on a joint delivery basis between the federal and provincial governments.

The federal component, managed by the Geological Survey of Canada, largely comprised airborne geochemical and geophysical surveys, as well as detailed mineral deposit and regional geological studies.

The provincial component of the MDA, the "Gold Belt Geology" geoscience program, has included geological mapping, geochemistry, isotope geology and related mineral deposit studies in areas which have been undergoing active exploration mainly for gold.

Some MDA projects are undertaken by the Mineral Development Branch and are described elsewhere in this report. Expenditures in 1988-89 on the MDA geoscience program were restored to earlier levels by means of a summer student employment initiative, for a total of approximately $692,000, up from the previous year's $458,400.

Geoscience Program

Mapping programs continue to be rated foremost in aiding the mineral exploration industry's current search for gold in northern Saskatchewan. In the first four years of the program the province largely concentrated its operations in the "La Ronge Gold Belt" northeast of La Ronge where a number of gold mines are being developed. Final compiled maps and reports on the results of this mapping continued in preparation. Geochemical studies mounted through the University of Regina were also being finalized and written up during the year.

In 1988-89, Precambrian projects diversified into new terrains to the east of the La Ronge Belt (the 'Glennie Domain') and farther west in the region of Ithingo Lake (the 'Mudjatik Domain'). These new areas were selected in response to indicated gold occurrences (Figure 1).

Glennie Transect - This project initiated in 1988-89, was designed to scan a cross-section of potentially mineralized 'greenstone' belts in the terrain around Brownell, Palf and Gee Lakes between La Ronge and Pelican Narrows. The project is multidisciplinary in nature, focussing around three 1:20,000 scale bedrock remapping parties staffed by departmental project geologists and summer students (A, B and C, Figure 1), and ancillary geochemical, mineralogical and structural geology studies carried out by university contractors (D, E and F, Figure 1).

These surveys and studies have so far indicated geological features which are related to gold mineralization. In the Brownell Lake area in particular (A, Figure 1), a number of existing gold showings have been related to such features, and recommendations have been made to industry in the form of regional exploration targets.

Samples were collected by the field parties for geochemical study at the University of Regina (D, Figure 1).

A pilot study of the pressure-temperature characteristics of mineral assemblages initiated in the summer of 1987 in collaboration with the University of North Dakota in the Pelican Narrows area, was followed up in 1988 to include the area being studied under the Glennie Transect (D, Figure 1). Preliminary results of this project have been encouraging, particularly in relation to the low cost of this technique and the leverage provided through U.S. funds.

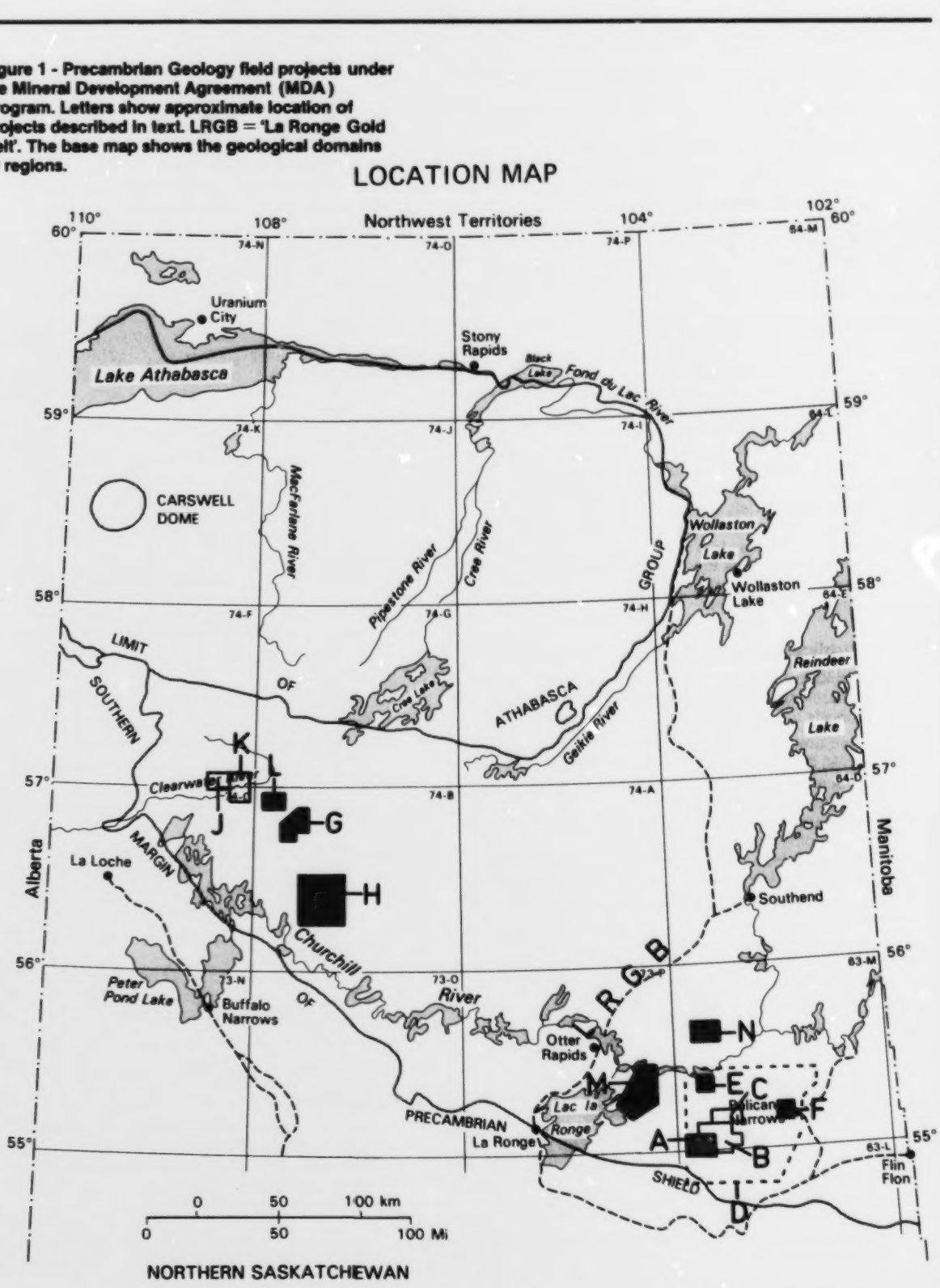
Ithingo-Porter Lakes Study - Following the discovery by industry of a new gold occurrence in the Ithingo Lake area earlier in the year, one staff project geologist and field crew made investigations in the Ithingo (G, Figure 1) and Porter Lake (H, Figure 1) areas in the 'Mudjatik Domain'. This is a new type of environment for gold mineralization, and follow up to this study is being watched with interest.

Snowbird Transect - The 'Snowbird Transect' was also mounted in the summer of 1988 in the area immediately adjoining to the west of Ithingo Lake (J, K and L, Figure 1). This program is a joint venture with the University of Kansas and the University of California, Santa Cruz campus, aimed at examining critical junctions between major geological domains, and includes the 'Clearwater Anorthosite', an environment possibly favourable to platinum group metal mineralization. The program, which is slated to last two field seasons, involves geological remapping by three graduate students with emphasis on geochemistry and isotopic studies through laboratories in the United States, where the majority of the funding is being provided.

Geochronological Work - A number of new U-Pb zircon dates were produced during the year through the joint-ventured geochronological program of the University of Kansas. A Ph.D student working under this program made important discoveries of two older (Archean) domes in the Glennie Lake area (M, Figure 1) which will have significant effects on the interpretation of the regional geology in this domain.

The Geological Survey of Canada produced two isotopic age determinations on rocks from the Glennie Domain through funds contracted by the province (N, Figure 1).

Figure 1 - Precambrian Geology field projects under the Mineral Development Agreement (MDA) Program. Letters show approximate location of projects described in text. LRGB = 'La Ronge Gold Belt'. The base map shows the geological domains or regions.



Kimberlite Discovery at Sturgeon Lake, Prince Albert Region - Of major interest during the year was the discovery of a kimberlitic pipe in the Sturgeon Lake area near Prince Albert, which became public knowledge in the fall of 1988. Kimberlite pipes are the major world source for diamonds, and the discovery promoted a major land staking play in the region. The branch head was involved in negotiations with Monopros, the De Beers subsidiary which made the discovery, and as departmental spokesman for this play, appeared several times on television and other media.

Precambrian Geodata

The regional geoscience databases include rock and mineral sample collections and other files. These files are used in-house and are also available on an increasing scale for consultation by industry and others. All files are now housed on microcomputer. Work was continued on the Geochronology and Precambrian Lexicon databases; the former is now essentially up-to-date, and the latter is still in the pilot stage. Trials were continued on graphical and geological software. All branch personnel now have exclusive access to a microcomputer, and the branch continues to look forward to the introduction of computerized cartographic and geographic information systems.

Publications and Presentations

Published and open file reports are issued periodically, based upon field programs, consultant's reports and in-house compilations.

Coloured compilation bedrock geology maps at 1:250,000 scale now cover over 65 per cent of the Precambrian Shield area in first edition (Figure 2). During the year one final coloured map was published (74B) and work on the preparation of final coloured versions of two other maps was deferred (63L and 63M). Work was continued on one preliminary map (74N).

Branch geologists also contributed the major part of the Saskatchewan Geological Survey Open House presentation in November 1988, attended by mineral industry representatives from across Canada and the U.S.A. Presentations were also made at other meetings held in North America.

Sedimentary Geodata Branch

Industrial Minerals Section:

The section is responsible for planning and implementing technical projects relating to industrial minerals; it provides informational and advisory services to industry, government agencies and the public on resources and technical matters and it also plays a role in the regulatory aspects of industrial minerals.

Exploration and development of the province's industrial mineral resources are monitored through personal communications and the evaluation of technical submissions by industry. This information in conjunction with in-house projects and knowledge of changing markets and technology help provide direction for the investigations of the branch, as well as industry.

A principal responsibility of the section is maintenance of a resource data base on industrial minerals as well as compilation of technical information on utilization, specifications and processing.

Records of assessment work conducted under the Quarrying Regulations, The Coal Disposition Regulations and The Subsurface Mineral Regulations are maintained by the section.

The section also contributes to the review of Environmental Impact Assessments on proposed mineral developments in the Sedimentary Basin area of the province. It also participates in the revision of mineral related regulations as required.

Several projects were in progress during the fiscal year:

- co-ordination of the building stone project under the Canada-Saskatchewan Mineral Development Agreement.
- contribution to a joint federal/provincial project for determining recoverable coal reserves in the Estevan area.
- sampling and analyses of kaolinized sand deposits in the Rural Municipality of Brokenshell.
- investigations of the significance of carnallite and de-carnallitization of the Prairie Formation in subsidence over Winnipegosis banks in Saskatchewan and the accumulation of brines in overlying formations.
- background investigations relating to the feasibility of commercial industrial brine accumulations and the application of waste carbon dioxide in the alteration of brines to useful value-added commodities such as soda ash and gypsum.
- field investigations of eight bodies of plutonic igneous rocks in the Missinipe-McLennan Lake area for their building stone potential.
- provision of information on the Devonian system in Saskatchewan for inclusion in the Geological Atlas of the Sedimentary Basin of Western Canada.

A total of 153 major inquiries on technical aspects of industrial minerals were handled by the unit. Most of the inquiries originated with industry and other government agencies. Figure 3 illustrates their distribution by commodity.

Figure 2 - Precambrian Bedrock Compilation Geology Maps, 1:250,000 scale.

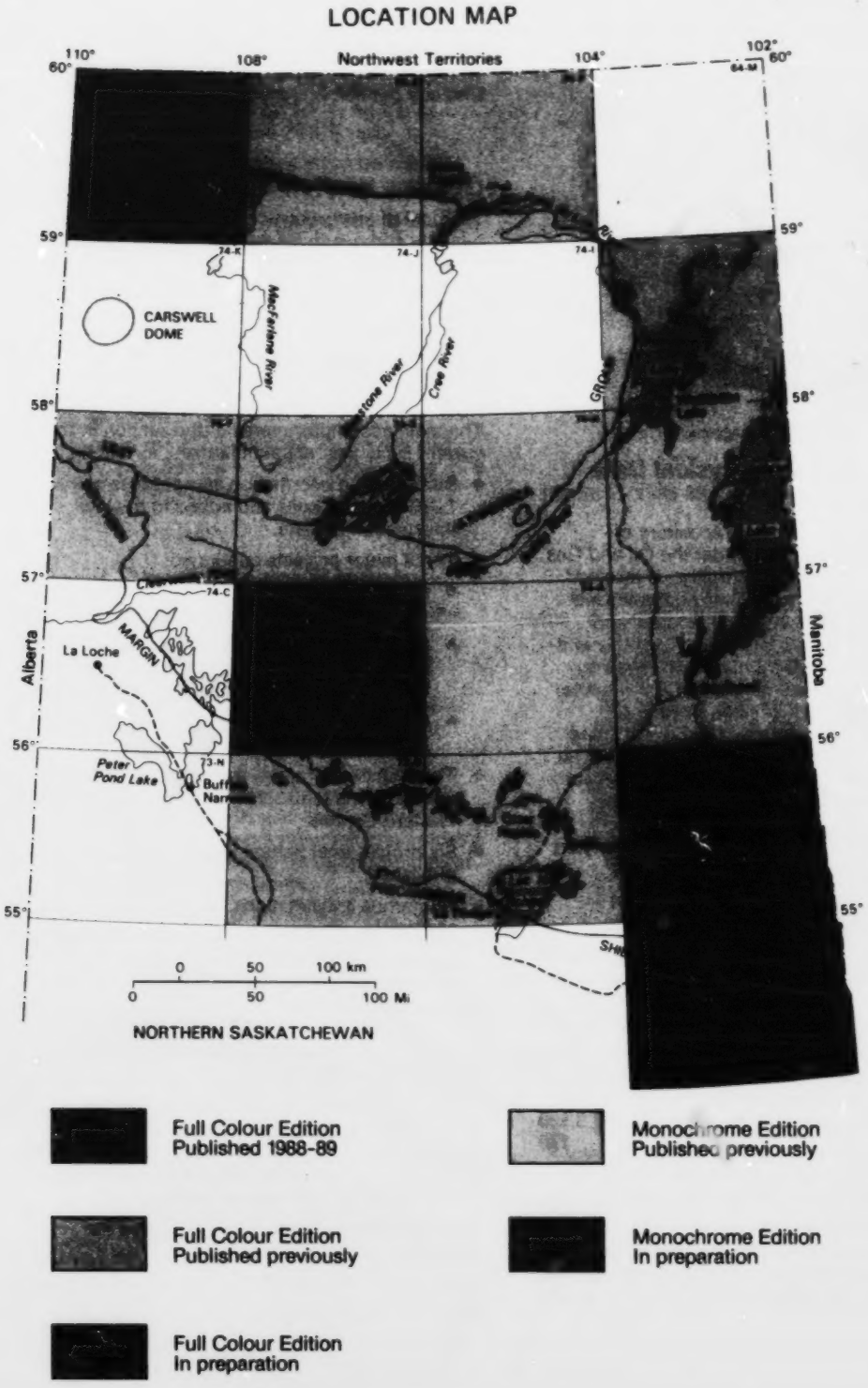


Figure 3 - Distribution of Industrial Mineral Inquiries

Well Records and Geophysical Data Section:

The section maintains a central repository of information from wells drilled under the Oil and Gas Conservation Regulations. Information is received, processed, entered into the on-line computerized system and filed. The section also receives and processes preliminary and final plans, monthly and final reports and geophysical maps submitted by industry under the Sedimentary Basin Geophysical Exploration Regulations. The manual and computerized data files are the basis for servicing industry, government agencies and the public. The unit also compiles indexes of geophysical data for quarterly petroleum and natural gas land sales. During the fiscal year work continued on the computerization of the geophysical map and report files.

The principal statistics relating to the work of section are summarized in the following table:

Well Files	**1988/89**
Data submission by industry	11,401
Files pulled	23,844
Photocopies for industry	28,339
New files set up	1,867
Letters requesting delinquent data	506
New wells coded and computerized	2,071
Supplementary data added to system	3,120
Computer searches	176

Geophysical Data	
Preliminary plan numbers issued	372
Final plans approved	424
Monthly reports processed	439
Geophysical maps reproduced for industry	560

Total revenue generated by information services	$39,318.00

Petroleum Geology Branch

The Petroleum Geology Branch occupies the Subsurface Geological Laboratory Building at 201 Dewdney Avenue East, Regina and comprises a Geology Section and a Warehouse Section.

Geology Section

The goal of this group is to increase both the quantity and quality of geological information available to industry and others interested in the sedimentary rocks of Saskatchewan. This is done by adding new information to, and upgrading information already in, the Well Information System; by undertaking geological research projects leading to published papers or reports; and by giving consultations on request to interested geologists.

The main accomplishments of the section in the current fiscal year are summarized, as follows:

- Stratigraphic information was processed from 1,873 licensed wells and added to the Well Information System.
- Three major projects continued:
  - Geology of the Medicine Hat Sand (Cretaceous) in Southwestern Saskatchewan.
  - Development of a Depositional Model for the Oil-Prone Jurassic Section in the Wapella-Moosomin Area, Southeastern Saskatchewan.
  - Geology of the Interlake Group (Silurian) in Saskatchewan.
- Three smaller projects were undertaken as contributions to the New Geological Atlas of Western Canada.
- Six professional papers were presented and/or published.
- Numerous consultations were given to industry geologists.
- Several workshops on Introductory Geology were arranged for school groups.

Warehouse Section

This group handles geological materials in the form of drill cuttings, cores and Precambrian field specimens. The material is processed and stored in the warehouse to be brought out for examination upon request by visiting geologists.

Activities during the fiscal year included the following:

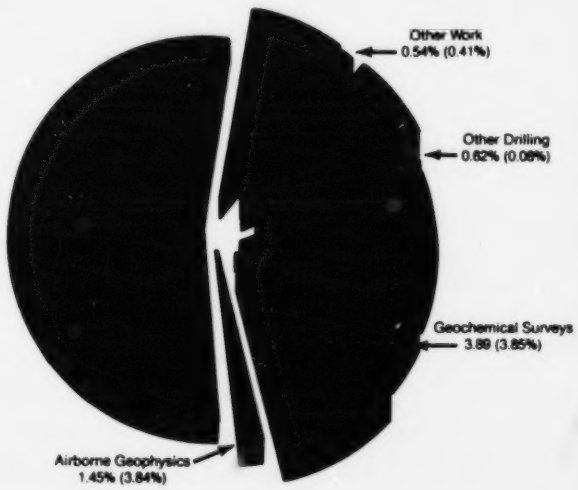
- New cores were received from 615 wells for a yearly total of 7,668 boxes bringing total number of boxes in storage to 279,670.
- New drill cutting samples were processed from 527 wells for a yearly total of 41,005 vials bringing total number of vials in storage to 2,020,512.
- New drill cutting samples were processed for shipment to Energy, Mines and Resources Canada from 484 wells for a yearly total of 38,740.
- Samples shipped to Energy, Mines and Resources Canada totalled 29,976 vials.
- Cores examined on premises came from 2,502 wells for a total of 37,774 boxes.
- Samples examined on premises came from 181 wells for a total of 11,188 vials.
- Users of the examination facilities totalled 149. Of these, 121 were from industry and represented 69 companies, while 28 represented 7 other organizations.
- Cores loaned out from the premises for study and/or analysis in other facilities came from 231 wells for a total of 3,400 boxes .
- Numbers of rock thin-sections, rock slabs and diamond polished sections prepared were 22, 578 and three respectively.

Mineral Development Branch

The branch is responsible for evaluating technical reports submitted as assessment work by the mineral industry under the Mineral Disposition Regulations 1986, and for maintenance of the historical exploration record represented by these reports. Also administered are the Saskatchewan Mineral Deposits Index and the offices of the resident geologists in La Ronge and Creighton. In addition, the branch undertakes geological studies of metallic mineral deposits and disseminates information about these, and about mineral industry activities and mineral development opportunities at both technical and general levels.

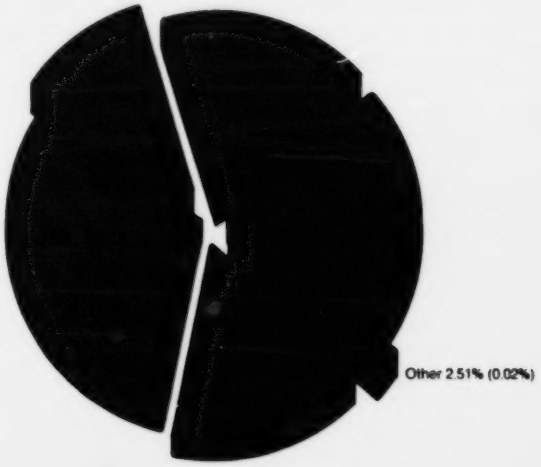
The yearly volume of assessment submissions provides an indication of the level of exploration activity, although it is not an absolute measure. A total of 1634 submissions were received for claimed expenditures of $31.7 million (up 1 per cent from 1987-88). These are broken down into specific exploration activities in Figure 4 and into regions in Figure 5.

Figure 4 - 1988-89 Assessment Credits by Activity.



( ) Denotes 1987-88 Figures

Figure 5 - 1988-89 Assessment Credits by Region.



( ) Denotes 1987-88 Figures

A total of 266 new assessment files were incorporated into the historical record, 144 visitors were received and 129 requests for information handled.

Work continued on computerization of the Saskatchewan Mineral Deposits Index and on

documentation of new occurrences. Data from all identified deposits, numbering 2140, are now microcomputer-entered and various software options are being evaluated for data manipulation capability. The index provides a primary reference for mineral exploration and land use planning. Major requests for information totalled 21.

The resident geologists, through offices in La Ronge and Creighton, monitor the mineral exploration industry in northern Saskatchewan and also assist it by providing up-to-date information on exploration and mining activities and opportunities. In the current fiscal year, both resident geologists were headquartered in La Ronge and the Creighton office continued to be operated on a part-time basis. The La Ronge office maintains files of current mineral claims, topographic maps, airphotos, geological maps and reports, and assessment work submissions. The Creighton office has current claim maps and one of the resident geologists from La Ronge was available for consultation at specified times throughout the year. In the current fiscal year, over 1250 visitors were received at the resident geologists' offices.

Studies of metallic mineral deposits and their geological settings were continued under the Geoscience Program of the five year (1984-89) Canada-Saskatchewan Subsidiary Mineral Development Agreement. Projects were implemented by branch staff and through contracts with the Universities of Saskatchewan, Regina and Waterloo, and the Saskatchewan Research Council.

Gold deposit investigations continued in the Sulphide Lake area, north of La Ronge, and a new project was initiated at the historic Box and Athona gold mines at Goldfields, south of Uranium City. Both areas are being actively explored by industry. Also in the Goldfields area work continued on a newly recognized type of polymetallic uranium-gold-platinum group element deposits, with mapping and laboratory projects being undertaken respectively by branch staff and under contract by the University of Regina. A second, branch project evaluated intrusions in the Peter Lake area for their rare-earth element potential. A study of Wollaston Group stratigraphy in relation to uranium deposits of the Athabasca Basin was contracted to the Saskatchewan Research Council.

The mineralized core collection, stored in La Ronge and administered through the office of the resident geologists, received additions totalling some 2654.3 m from uranium deposits in the Athabasca Basin and from gold and base metal deposits in the La Ronge and Flin Flon regions. Some 44 people examined core from the collection during the fiscal year.

The Prospectors' School was run in La Ronge by branch staff in conjunction with the Saskatchewan Institute of Applied Science and Technology, Woodlands Campus, Prince Albert. The school offered a six week course to students of all ages primarily from northern communities. A total of 17 students graduated from the course out of an enrollment of 22. Funding for 20 of the participants was provided under the Canada-Saskatchewan Northern Employment Development Subsidiary Agreement. The course is deemed particularly relevant during the present period of intensive gold exploration, as prospecting even in today's age of technology still represents one of the most effective gold exploration methods.

The 1:250,000 scale metallogenic map series established in 1984-85 received ongoing attention. These maps provide details of location, metal association, development status and type of mineralization, as well as references to information on all noted mineral occurrences. They augment a similar scale compilation bedrock geology series and provide a valuable reference for the mineral exploration industry. Two new sheets were released in 1988-89 with a further two in editing at year end.

Mines Branch

This branch is responsible for the disposition, development and conservation of all Crown minerals with the exception of petroleum, natural gas, helium and oil shale. The activities of the branch are carried out through the Mining Lands Section and the Mines and Statistics Section.

Mining Lands Section

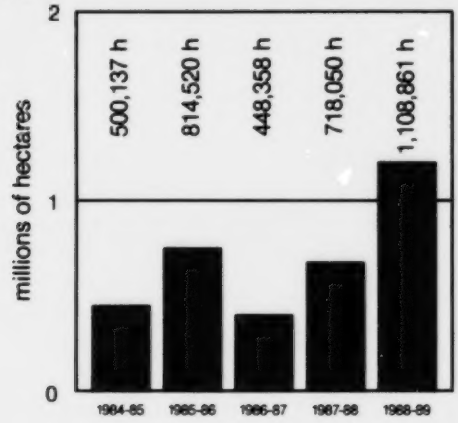
Mining Lands administers and disposes of Crown minerals under the following regulations:

- The Mineral Disposition Regulations, 1986 (uranium, base and precious metals)
- The Quarrying Regulations, 1957 (sand, gravel, clay, bentonite and other quarriable substances)
- Alkali Mining Regulations (sodium sulphate)
- The Coal Mining Regulations, 1988 (coal)
- The Subsurface Mineral Regulations, 1960 (potash, salt)

Activities of the section are centred in Regina, with a field office maintained in La Ronge to permit local administration of regulations.

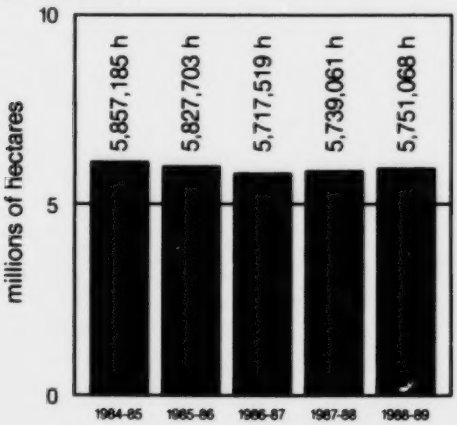
A total of 1,615 new mineral claims covering 1,006,751 hectares were taken out during the year under The Mineral Disposition Regulations, 1986, an increase in area of 29 per cent from the previous year. The increase was a result of the high level of diamond exploration activity in the Southern Mining District of the Province (Figure 6).

Figure 6 - New areas acquired under claims and permits.



As of March 31, 1989, there were 3,998,319 hectares held under 4,743 mineral claims; 902,164 hectares held under 13 prospecting permits; and 850,585 hectares held under 668 leases for a total area of 5,751,068 hectares (Figure 7).

Figure 7 - Total areas under disposition (claims, permits, leases)



In the year under review, 14 prospecting permits covering 20,262 hectares and 55 leases covering 1,035 hectares were issued under The Quarrying Regulations, 1957. Of the 14 prospecting permits, four were issued for kaolin, silica sand and limestone. At year end 43,305 hectares were held under 25 prospecting permits and 28,972 hectares were held under 1,140 leases.

The Coal Disposition Regulations, 1988, came into effect in July 1988. No coal permits or leases were issued prior to that date for the 1988-89 fiscal year. However, from January to March, 1989, 88 leases covering 19,408 hectares were issued; increasing the total hectares under coal lease to 118,808. This number included applications which were held pending revision of the Regulations. Fifteen coal prospecting permits were issued and 39 were surrendered, reducing the total number of active permits to 50 covering an area of 25,598 hectares.

Two alkali mining leases were issued to Saskatchewan Minerals during the year, increasing the total alkali dispositions held on March 31, 1989 to 36 leases covering 13,371 hectares.

Under The Subsurface Regulations, 1957, nine potash leases exist, covering 198,483 hectares. Although one permit was issued, three were surrendered, reducing the area under potash permits to 91,010 hectares

Mines and Statistics Section

The major functions of the section are to:

- monitor mining developments and operations, pertaining to those minerals for which the branch has responsibility;
- collect, process and maintain records and disseminate statistical data related to mineral production;
- prepare revenue and economic forecasts for the base and precious metals sector of the industry;
- co-ordinate the department's review and response to project submissions referred by Saskatchewan Environment and Public Safety as part of the environmental impact assessment process and, evaluate those project submissions dealing with mining developments; and
- provide technical advice and assistance related to mining to other branches and divisions in the department.

During the fiscal year, one potash mine was converted from a conventional to a solution mine. Yearly plans of mining advances were acquired from 20 operating and test mines in 1988. Of the mines submitting excavation plans, three coal and two potash minesites were visited during the report period.

A new survey form to acquire basic operating information from base and precious metal mines was developed. The information will be utilized for monitoring mining activity and for preparing revenue and economic forecasts. Several economic and fiscal forecasts were prepared during the year. The existing survey form: "Mining Return for Metallic Minerals" was also revised to include the amount of

metal production. The form had previously only reported the amount and value of sales and the quantity of metal held in inventory.

Statistical data on the production and value of sales of potash, uranium, coal, gold, sodium sulphate, bentonite and, sand and gravel were collected, processed and summarized into monthly, quarterly and yearly information tables. The summarized information was disseminated to a variety of users consisting of four government departments and 34 private or semi-private organizations.

The section co-ordinated reviews of 46 environmental project submissions referred to the department, 17 of which dealt with mine developments and were reviewed by section staff. In addition to the 17 reviewed submissions, technical reviews and studies were done on 14 requests of various subjects related to operating potash and coal mineral properties, mineral statistics and potash r & d projects.

Section staff handled 11 requests from other departments and agencies for information on a variety of topics related to mine development. Section staff represented the department at six committee meetings. These committees dealt with a number of issues concerning the province's mineral industry including r & d initiatives, development proposals and the collection and dissemination of mineral statistics.

Petroleum and Natural Gas Division

Bruce Wilson
Executive Director

The Petroleum and Natural Gas Division has major responsibilities in all areas related to provincial jurisdiction over oil and gas resources including disposition and management of Crown oil and gas rights; well licensing and surveillance of all exploration, development and production operations; oil and gas conservation including determination of reserves and producibility estimates; maintenance of production and disposition statistics; crude oil marketing; and royalty and tax legislation.

The responsibilities of the division are carried out through the operation of five branches:

- Geology and Petroleum Lands
- Engineering Services
- Economic and Fiscal Analysis
- Petroleum Development
- Petroleum Statistics

1988 proved to be a relatively active year for the oil and gas industry in the province even though oil and gas prices weakened from the previous year. A total of 2,082 wells were drilled in 1988 with 1,048 wells being completed as potential oil producers and 742 wells being completed as potential gas producers. The number of gas wells drilled in 1988 represents an all time record high for the natural gas industry in the province. Although interest in Crown oil and gas rights remained relatively strong, land prices dropped reflecting the lower oil and gas prices. Total bonus bids for 1988 were $35.0 million compared with $59.9 million in 1987.

Crude oil production rose to 12.3 million cubic metres in 1988 compared with 12.1 million cubic metres in 1987. A more dramatic increase in gas production was realized as the 1988 non-associated gas production level of 3.75 billion cubic metres represented an increase of approximately 65 per cent over the 1987 level. Total associated and non-associated gas production in 1988 was 4.64 billion cubic metres.

Regina's NewGrade Heavy Oil Upgrader became operational in late 1988. While the facility has encountered some start-up difficulties, it is expected that the rated capacity of approximately 8,000 cubic metres per day will be reached during the next year.

A joint venture agreement signed on September 2, 1988 by the Governments of Canada, Alberta and Saskatchewan and Husky Oil Operations Ltd. will result in a second heavy oil upgrader being built in Saskatchewan. The $1.267 billion Bi-Provincial Upgrader to be built at Lloydminster, Saskatchewan will be capable of processing approximately 7,300 cubic metres per day of heavy oil when it becomes operational in late 1992. The feedstock will be sourced equally from Alberta and Saskatchewan.

Petroleum Development Branch

The Petroleum Development Branch is primarily responsible for ensuring that the field operations of the province's oil and gas industry meet acceptable technical and environmental protection standards, that well licensing proceeds in accordance with regulations established under The Oil and Gas Conservation Act and that geophysical activities occur in accordance with The Sedimentary Basin Geophysical Exploration Regulations.

The Regina staff:

- directs field office operations;
- processes and approves applications for well drilling licences;
- enters initial data for the Well Information System;
- maintains records and control of well deposits made to guarantee proper drilling, completion and abandonment of wells;
- processes and approves well ownership and name changes;
- advises of offset drilling commitments on Crown land;
- processes weekly drilling reports and compiles statistical data relating to drilling activity;
- represents the department on oil spill co-operatives; and
- processes and approves applications for Geophysical Licences, Crew Certificates and Blasters Permits.

The field office staff:

- collects and compiles drilling, completion and reservoir data;
- enforces regulations, orders and policies pertaining to pollution control in the oil and gas industry;
- checks standards, procedures and equipment used by industry in drilling, producing and abandonment of wells;
- witnesses production tests;
- performs on-site inspections of all wells and facilities;
- investigates and assists in resolving landowner problems associated with the use of land for geophysical activity, exploration and production; and
- investigates, reports and ensures that industry act promptly and efficiently in handling oil and salt water spills.

Regina staff continued to upgrade the computerized Well Information System as well as add new well licences and the information associated with its drilling. They are also responsible for the maintenance of up to date wall maps which give such information as well type, completion horizon and pool boundaries. Industry, the general public and various department personnel make extensive

use of the maps. Similar maps are maintained by each of the four field offices for their specific areas, and are also used by many.

In addition to issuance of drilling licences mentioned under the Drilling Activity heading, the branch also called 180 offset commitments on Crown lands. Offsets are created by freehold mineral wells being placed on production adjacent to Crown land. Seismic and logging crew numbers increased slightly. This year staff issued 57 geophysical licences, 1[illegible] crew certificates and 125 blaster permits. Well ownership changes were registered on 3,274 wells with name changes being made on 1,412 wells. A large number of inquires continue to be handled regarding drainage units, target areas and the requirements necessary when drilling, producing and abandoning oil or gas wells in the province.

Environmental surveillance is ongoing with field staff conducting numerous inspections. During the year in excess of 41,000 inspections were carried out on well, battery and rig sites, clean-up was monitored on 534 oil and salt water spill sites (this number is a slight reduction from the previous year), approximately 300 drilling mud pits were inspected to ensure that proper disposal techniques were being employed and 45 landowner related complaints were resolved.

Field staff also inspected, acquired and reported on all of the drilling, completion and abandonment activity, carried out 1,446 pressure maintenance/ water disposal well checks and witnessed 603 production test audits. Staff are continuing to monitor drilling mud disposal and retained the Saskatchewan Research Council to further their investigative work. Steps were taken to initiate an Environmental Fund which will replace the outdated and inadequate well deposit system.

Drilling Activity

Drilling activity in 1988 increased compared with 1987 activity.

In 1988 there were 2,082 oil, gas and service wells drilled. A breakdown of this activity follows: 1,048 cased oil wells, 742 cased gas wells, 35 cased service wells and 257 abandoned dry holes. This represents an 88 per cent success rate. Increased interest in gas led to the largest number of gas wells ever drilled in a single year. Figure 8 gives a breakdown of the wells drilled by area. Well licensing also had a significant increase, rising to 2,175 compared to 1,671 in the previous year or a 30 per cent increase.

Figure 8
Wells Drilled by Area

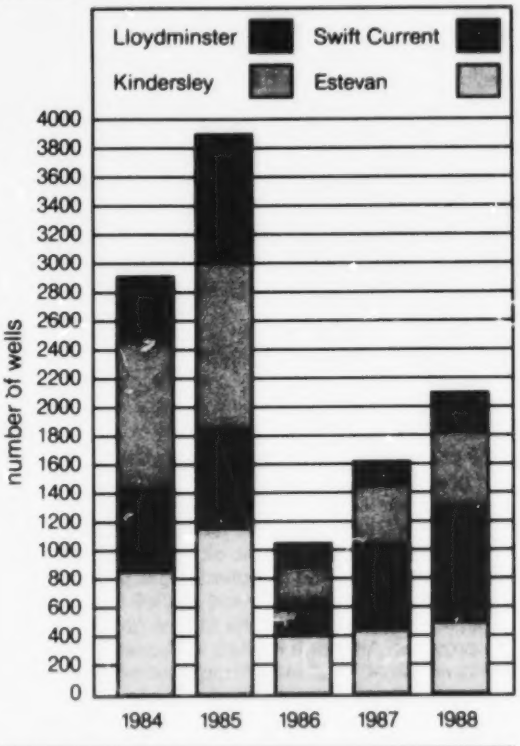
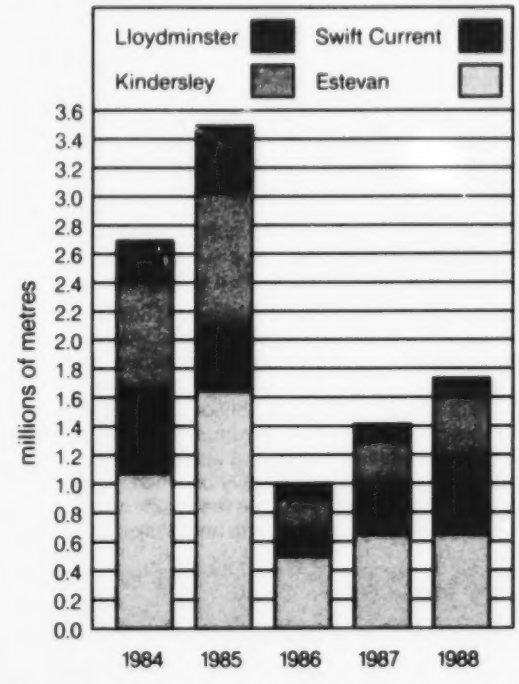


Figure 9
Metres drilled by area



Engineering Services Branch

The Engineering Services Branch evaluates Saskatchewan's crude oil and natural gas reservoirs to ensure that exploration, development and production of these resources follow good conservation and engineering standards. Sound management of these resources is essential to achieve efficient production and ensure maximum benefits from development. The mandate for these responsibilities comes from The Oil and Gas Conservation Act, The Crown Minerals Act, The Pipe Lines Act and respective regulations.

Specifically this branch:

- determines crude oil and natural gas reserves for use by industry and government in planning and developing policies;
- evaluates industry applications for enhanced oil recovery projects, waste water disposal wells, off-target wells and other proposals and participates in public inquiries held to consider these applications;
- assesses unitization proposals to ensure that Crown lands receive fair and equitable unit participation;
- evaluates industry submissions for incremental oil production from waterflood and enhanced oil recovery projects to establish reduction to Crown royalties and freehold production taxes,
- establishes pool boundaries, well spacing and target areas to facilitate orderly crude oil and natural gas development;
- issues maximum permissive production rates for oil wells and daily allowables for gas wells, and monitors production to ensure that these rates are not exceeded;
- issues construction and operating permits for oil and natural gas pipelines and witnesses pressure tests conducted to ensure that pipelines meet operating standards;
- prepares for publication, pertinent engineering, development and production data for oil and natural gas pools, including monthly demand for Saskatchewan crude oil;
- monitors crude oil markets and tabulates nominations for crude oil; and
- provides technical expertise and assistance to other branches and divisions in the department.

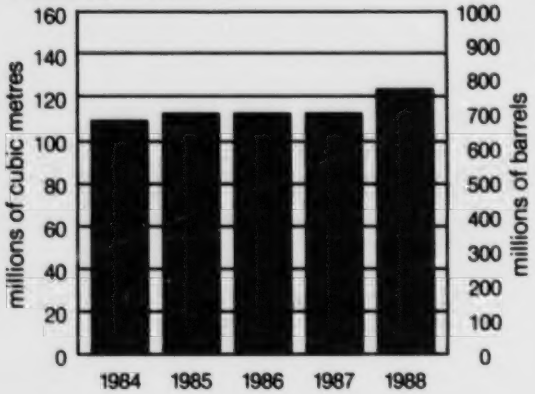
Highlights

- Three additional horizontal wells were drilled in the province following the successful drilling and completion of Saskatchewan's first horizontal well by Sceptre Resources Limited in the Tangleflags area in 1987.
- The deregulation of natural gas markets and prices in the province in 1987 prompted unprecedented gas exploration and development activity which resulted in an all time gas well drilling record in the province in 1988 of 742 wells exceeding the previous record of 568 wells in 1987.
- The prorationing of crude oil production was suspended indefinitely on October 1, 1988, following a trial period of one year as recommended by an industry/government task force study.
- The system of allowables for gas wells was modified after a review by an industry/government task force which recommended that only wells with equity or reservoir problems should retain allowables.
- The Oil and Gas Conservation Act was amended in 1988 which now provides for the ability for the department to review applications for forced pooling and applications for amendments to the statutory unit operation plans.
- Twenty new units and unit expansions were approved in 1988 to accommodate new or expanded waterflood projects. Forty two waterfloods and modifications were approved in 1988.

Crude Oil Reserves

- Saskatchewan's remaining established crude oil reserves were increased by an estimated 7.168 million cubic metres to 120.700 million cubic metres in 1988. This is the net result of an increase in initial reserves of 19.455 million cubic metres and production of 12.3. These reserve increases are largely attributed to new and expanded waterflood projects and significant Winnipegosis formation discoveries in 1988.
- The department estimates that the potential enhanced oil recovery reserves are 667 million cubic metres with 89 per cent of these reserves classified as heavy oil.
- These potential reserves are an indication of the oil that can be recovered assuming that enhanced oil recovery techniques are successfully applied. Considerable technical risk currently exists requiring further research and experimentation.

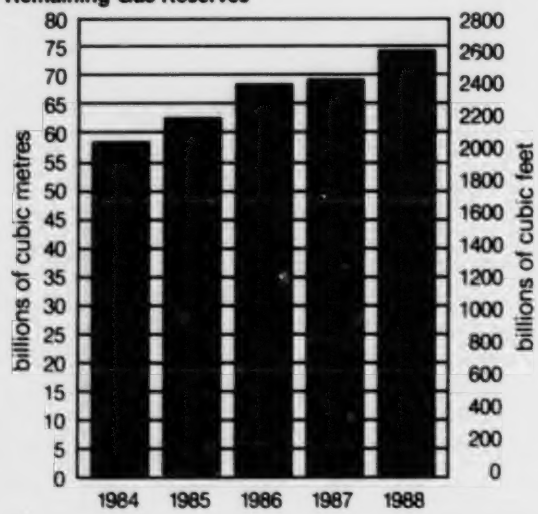
Figure 10
Remaining Oil Reserves



Natural Gas Reserves

- Saskatchewan's remaining established natural gas reserves were increased by an estimated 5.1 billion cubic metres to 74.4 billion cubic metres in 1988. This is the net result of an increase in initial reserves of 9.2 billion cubic metres less production for sales of 4.1 billion cubic metres.
- The department estimates that the remaining ultimate potential which includes establishe ! reserves could reach 161 billion cubic metres. Additional exploration and development is required for better evaluation.

Figure 11
Remaining Gas Reserves



Crude Oil Production

- Oil production in 1988 was 12.3 million cubic metres compared to 12.1 million cubic metres in the previous year. This slight increase was the result of continued strong markets for Saskatchewan's crude oil and the drilling activity. On average, there was minimal shut-in of production due to marketing difficulties and pipeline capacity in 1988.
- Saskatchewan's oil production is made up of different qualities of crude commonly identified as light, medium and heavy found in different geological zones and geographical areas. In 1988, approximately 30.0 per cent was heavy oil, 36.2 per cent was medium and 33.8 per cent was light.

Figure 12
Crude Oil Production

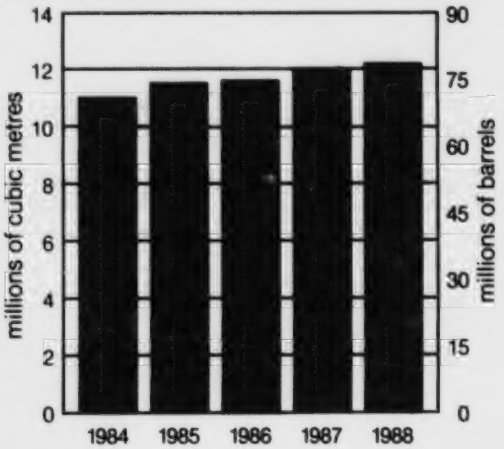
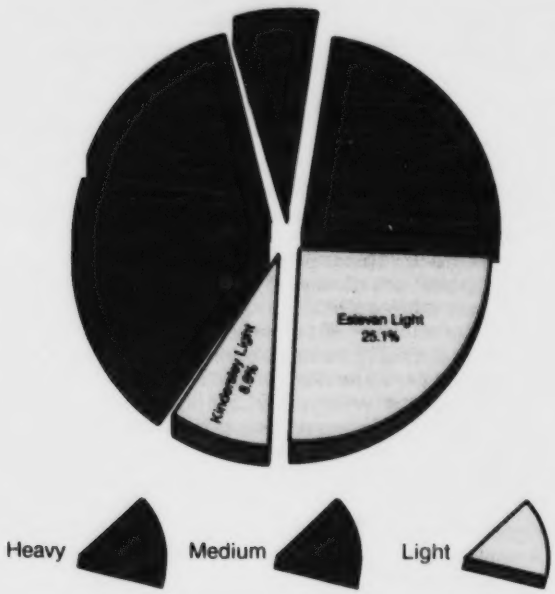


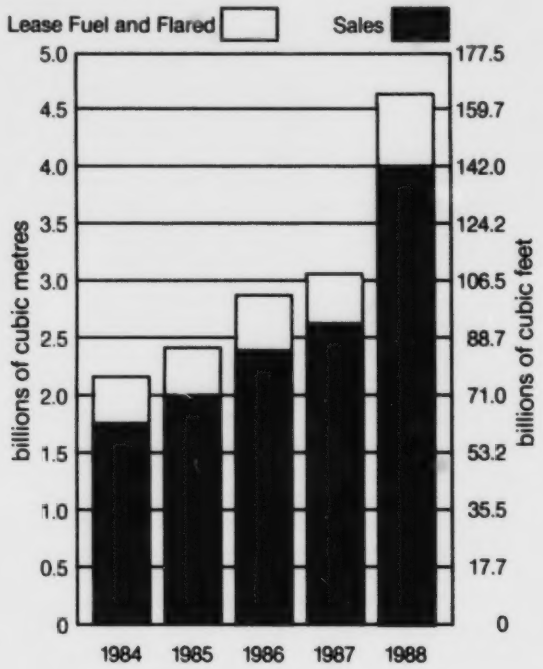
Figure 13
Quality of Saskatchewan Crude Oil Production by Area for Calendar Year 1988



Natural Gas Production

Natural gas production in 1988 was 4.6 billion cubic metres, an increase of 48 per cent from the previous year when it was 3.1 billion cubic metres. Sales of the province's natural gas were four billion cubic metres with the remainder of the production used for lease fuel or flared. Approximately 1.4 billion cubic metres of natural gas were exported from the province in 1988. Natural gas production will progressively increase because of better access to the export market as a result of deregulation. This will allow the province's shut-in reserves to be developed and produced as well as causing further exploration.

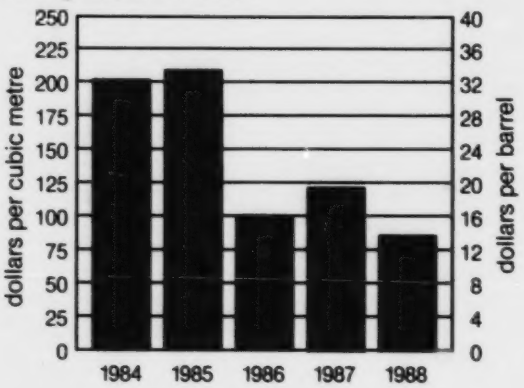
Figure 14
Natural Gas Production



Average Crude Oil Prices

The average 1988 Saskatchewan crude oil price of $84.00 per cubic metre represents a 32 per cent decrease over the $124.33 per cubic metre average for 1987. This decrease follows the decrease in world oil prices over that time period.

Figure 15
Average Crude Oil Prices



Geology and Petroleum Lands Branch

Geology Mapping and Land Evaluation Section

This section has two principal responsibilities: geological mapping and land evaluation.

Geological Mapping Unit

Geological maps (mainly structure contour maps) are drawn and maintained for all oil and gas producing areas in the province. The maps are used for land evaluation, for reserve calculations in the Engineering Services Branch, and in helping solve problems related to the producing areas. At the end of the fiscal year, 122 pool structure contour maps were being maintained. The maps may be purchased from the department's Marketing and Publications Branch.

In carrying our their mapping work, geologists acquire a detailed knowledge of the geology of the producing oil and gas pools. This expertise is put to use within the Petroleum and Natural Gas Division when staff members are asked to make recommendations on submissions from industry or in dealing with other administrative matters.

Industry submissions in the reporting period included applications for pressure maintenance of producing units, conversion of wells to salt water injection and disposal, and secondary recovery of oil by waterflood. As well, requests were received for permission to drill wells outside the approved spacing pattern and for abnormal well spacing patterns.

Information and advice were made available to other branches, departments and the general public on requests ranging from the interpretation of the economic geology of known oil and gas accumulations to the hydrocarbon potential of unexplored prospects.

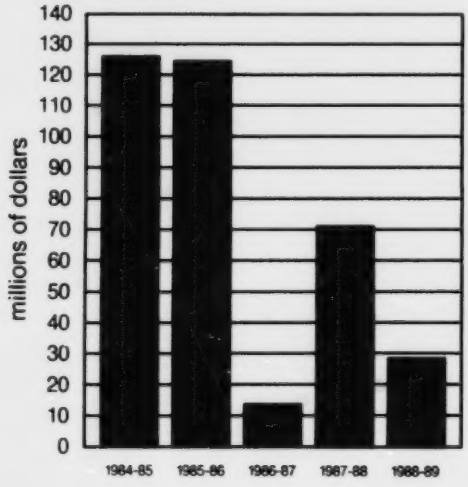
Land Evaluation Unit

The economic potential of hydrocarbon resources underlying specific areas of the province is determined as required by the department. Monetary evaluations of reserves are primarily for land sales. As well, this unit:

- reviews and recommends requests from industry for the posting of specific Crown mineral lands at department land sales;
- prepares sales notices and technical data for sales;
- reviews and recommends acceptance or rejection of bonus bids received from industry on posted lands;
- evaluates and selects Crown acreage in drilling reservations when such reservations go to lease;
- administers net royalty leases and inspects non-unit net royalty leases and farmouts to ensure compliance with the terms or agreements made with the department;
- reviews requests for waiver of offset well commitments on leases adjoining certain freehold lands producing oil or gas and makes follow-up recommendations;
- advises industry and the general public concerning the value of mineral rights for specific areas.

Four sales of Crown petroleum and natural gas rights were held during the 1988-89 fiscal year. Revenues totalled $29,724,179.93. This compares to $70,429,478.97 received during the previous fiscal year. Dispositions of mineral rights in the 1988-89 fiscal year totalled 599,204 hectares (1,480,666 acres) consisting of 49 permits containing 420,458 hectares (1,038,975 acres), 12 drilling reservations comprising 24,479 hectares (60,489 acres), and 778 lease parcels consisting of 154,267 hectares (381,202 acres). Revenue derived from the sale of petroleum and natural gas rights for the past five years is shown in Figure 16.

Figure 16
Revenue Received from Sales of Crown Petroleum and Natural Gas Rights.



Petroleum Lands Section

This section has three principal responsibilities: disposition administration, disposition review and registration.

Disposition Administration

This responsibility involves the administration and disposition of approximately 10.9 million acres of Crown mineral lands under The Petroleum and Natural Gas Regulations, 1969; The Helium and

Associated Gases Regulations, 1964; The Oil Shale Regulations; The Crown Minerals Act, and The Oil and Gas Conservation Act.

The number of petroleum and natural gas permits under disposition increased from 111 at April, 1988 to 116 at March 31, 1989 with a proportionate increase in area from 763,936 hectares (1,887,727 acres) to 861,158 hectares (2,127,967 acres). Drilling reservations under disposition decreased in the same period from 20 to 14 with a decrease in area from 31,174 hectares (77,032 acres) to 27,288 hectares (67,429 acres). Petroleum and natural gas leases in effect increased from 10,854 at April, 1988 to 11,437 at March, 1989. Area under lease totalled 2,874,048 hectares (7,101,929 acres). Lands under helium leases remained at nine with no change in area at 21,548 hectares (53,247 acres). Helium permits in effect increased more than twofold from eight to 20 with a proportionate increase in area from 171,417 hectares (423,581 acres) to 533,667 hectares (1,318,720 acres) at March 1989. Oil shale permits decreased to three in an area of 52,059 hectares (128,640 acres). A total of 11 gas storage agreements in an area of 39,106 hectares (96,633 acres) were in effect.

Disposition Review

All expiring dispositions are reviewed annually to establish whether they will remain active for another year. A total of 5,858 dispositions were subject to review in March, 1989 which represents an increase of approximately 500 dispositions from the 5,358 reviewed in April, 1988.

Registration

This responsibility involves the monitoring, recording and registering of transactions directly affecting all dispositions through transfers, amalgamations, encumbrances or securities.

A monthly average of 414 transactions occurred in 1989 which represents a decrease from the monthly average of 439 in the previous year. The number of transactions affecting dispositions decreased from 5,271 at April, 1988 to 4,974 at March, 1989. Searches increased from 3,764 at April, 1988 to 4,910 at March, 1989. The highest ever recorded total for searches was 929 in the month of June, 1988. The monthly average of searches increased from 314 in the previous year to 409 ending March, 1989.

Economic and Fiscal Analysis Branch

The Economic and Fiscal Analysis Branch evaluates, designs and implements oil and gas Crown royalty and freehold production tax systems and exploration/development incentive systems to maximize provincial revenues while maintaining an active oil and gas industry. In addition, the branch provides production, revenue, expenditure and employment forecasts related to Saskatchewan's oil and gas fields.

Functionally, the branch is divided into the Royalty/Tax Analysis Section and the Incentive Administration Section.

Royalty/Tax Analysis Section

This section analyses, designs and amends the crude oil and natural gas Crown royalty and freehold production tax regimes cited within The Petroleum and Natural Gas Regulations, 1969 and The Freehold Oil and Gas Production Tax Regulations, 1983. The production, revenue and employment forecasts for internal and external uses are also prepared by this section.

More specifically, this section:

- evaluates the economics of crude oil and natural gas exploration, development and production under varying federal and provincial fiscal arrangements;
- analyses, develops and proposes royalty and tax incentives to encourage implementation of enhanced oil recovery schemes, (e.g. waterfloods, steamfloods, carbon dioxide floods) and drilling techniques (e.g. horizontal wells);
- monitors and forecasts crude oil prices, gross oil revenues, provincial revenues, oil production and related oil expenditures and employment for internal government use;
- analyses the impact of changes, (e.g. world prices, exchange rates) that affect oil and gas activity in the province and surrounding jurisdictions;
- provides analytical assistance pertaining to upgrader negotiations and consumer gasoline inquiries;
- monitors revenue sharing between governments and industry;
- prepares submissions to boards, commissions and other external bodies on future crude oil supplies;
- prepares information circulars, directives and notices to keep industry informed of changes; and
- performs the necessary consultation process with industry and other departments regarding policy changes.

Crude oil price volatility resulted in amendments to royalty/tax levels on 10 separate occasions during 1988 in accordance with the price sensitive policy. In addition, regulation amendments to incorporate the Saskatchewan Resource Credit, which was introduced as part of the March, 1988 Provincial Budget, were put into effect on July 1, 1988.

Interest in horizontal well technology reached new

highs during 1988. Numerous economic evaluations of proposed horizontal well projects were carried out in order to design an applicable royalty/tax regime for this new technology. As a result of such analysis, the EOR royalty/tax regime was made available for all horizontal wells drilled prior to 1991.

On the natural gas side, the branch continued to develop new administration and monitoring procedures in order to follow the new price sensitive royalty/tax policies which were introduced in 1987 in conjunction with deregulation of the natural gas industry.

Incentive Administration Section

The Incentive Administration Section is responsible for the development, analysis and administration of incentive programs offered by the province to promote increased activity. The section closely monitors the cost effectiveness of these incentive programs to ensure maximum return for the province's incentive dollar and to maintain a positive climate for development and exploration in the province.

This section reviews all requests related to the administration of the oil royalty/tax holiday program. Under the program in 1988, special development wells drilled prior to July 1 qualified for a three year holiday and those drilled after June 30 qualified for a two year holiday. Similarly, incremental production from new or expanded waterflood projects commencing operation prior to July 1 qualified for a three year holiday and those commencing operation after June 30 qualified for a two year holiday. Infill wells continued to qualify for a one year holiday, non-deep exploratory wells and deep development wells for a three year holiday and deep exploratory wells for a five year holiday.

In 1988, 1,281 oil wells were licenced to be drilled in Saskatchewan. Of the total oil well licences issued, 110 were infill wells qualifying for a one year royalty/tax holiday, 1,044 were special development wells qualifying for either a two or three year royalty/tax holiday, 68 were non-deep exploratory wells qualifying for a three year royalty/tax holiday, five were deep development wells qualifying for a three year royalty/tax holiday and 22 were deep exploratory wells qualifying for a five year royalty/tax holiday. The remaining 32 licenced wells did not qualify for a royalty/tax holiday. In total, 1,028 of the wells drilled in 1988 were successful and completed as oil producers.

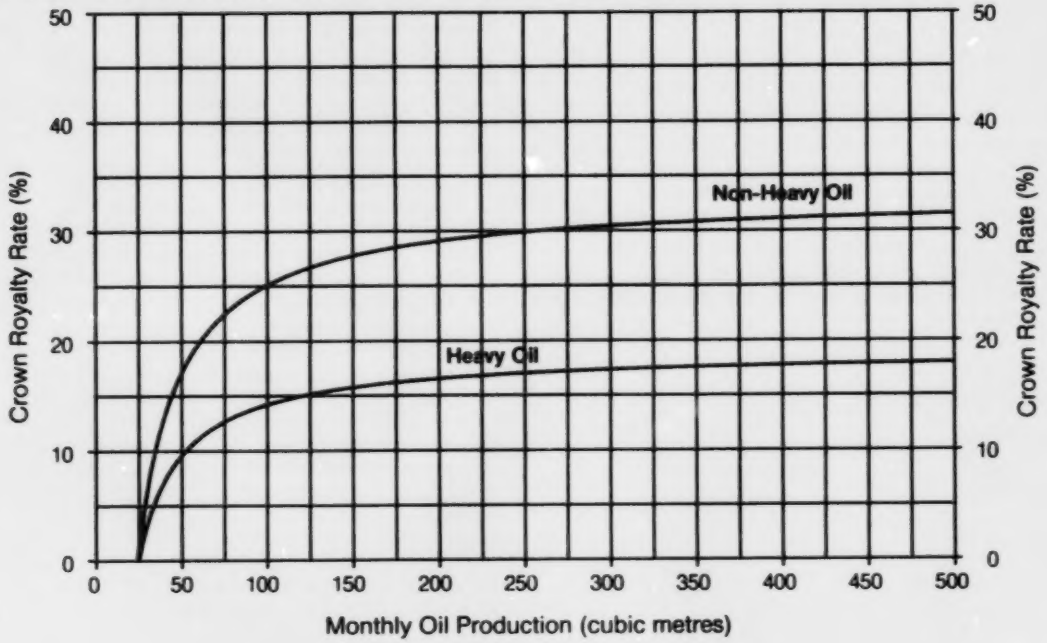
Economic and technical evaluations were carried out under the Workover Incentive Program; a program that encourages work to be performed to maintain and improve production from old oil wells or units. Under this program the department approved approximately $3.2 million of incremental work by the industry in 1988.

The special provisions introduced in 1987 to enable companies operating in the province to expedite recovery of their outstanding incentive balances under The Approved Expenditure Grant Program were managed through 1988. By the end of 1988, the outstanding incentive balance had been reduced by just over two-thirds and 222 companies had made application.

The Incentive Administration Section also performs the following duties:

- monitors and forecasts exploration and development expenditures;
- monitors and forecasts operating costs associated with the production of crude oil;
- determines the initial holiday status of wells as noted on the "Application for Licence to Drill a Well";
- reviews and makes recommendations in regard to holiday extensions due to marketing restrictions or other exceptional circumstances;
- evaluates and analyses the exploration, development and production incentive systems of the federal government and other provinces;
- prepares information letters and policy directives;
- conducts economic and engineering analyses on special issues, wells and/or projects.

Figure 17
Conventional crude oil royalty curves for new developments, March, 1989



Petroleum Statistics Branch

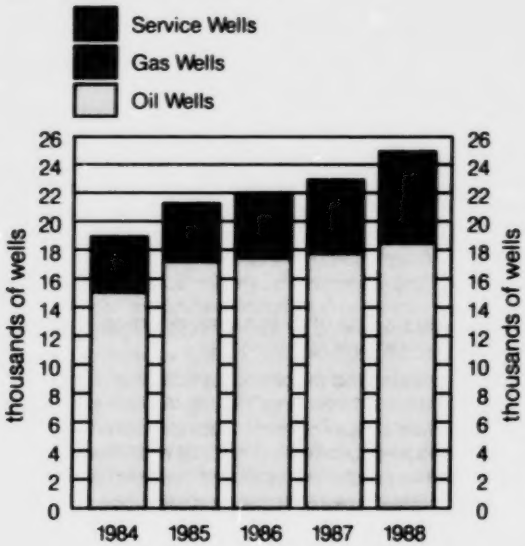
The Petroleum Statistics Branch is responsible for the collection, processing and management of statistical data on the production and disposition of petroleum resources in the province in accordance with the regulatory requirements of The Oil and Gas Conservation Act and regulations thereunder, for the maintenance and efficient operation of computerized data processing and storage systems, for the administration of the Production Monitoring/Testing/Auditing Program, for monitoring and evaluation of wellhead oil and gas prices and transportation costs, and for providing statistical services to both internal and external users.

In particular, the branch:

- collects, validates, processes and records statistical data on the production and disposition of crude oil, natural gas, water and other products associated with oil and gas field operation;
- maintains, develops and implements appropriate modifications and enhancements to existing computer systems as well as designs and develops new systems to meet new policy initiatives;
- participates in a joint review process with other western producing provinces and industry task force committees on the development and standardization of all industry reporting forms, procedures and requirements;
- administers and co-ordinates activities of the Production Monitoring/Testing/Auditing Program to ensure proper and accurate measurement and allocation of production among wells tied to a common producing facility with primary emphasis on wells receiving royalty/tax incentives;
- reviews, establishes and informs industry of the appropriate royalty/tax status and length and commencement date of incentive period of new wells/units as well as maintains and updates the status of existing wells/units;
- monitors, analyses and evaluates posted terminal prices and reported wellhead prices of Saskatchewan crude oil and natural gas and the delivered price of that oil and gas to specific markets;
- monitors and investigates oil and gas production and disposition reporting practices to ensure compliance and to provide assistance and interpretation to industry with regard to regulatory requirements;
- reviews, analyses and evaluates pipeline tariffs and trucking costs and its economic impact on provincial royalty/tax revenues;

- monitors, researches and compiles statistical information pertaining to the marketing of Saskatchewan crude oil and natural gas production;
- monitors, assesses and establishes the quality of Saskatchewan crude oil production on an individual well, battery and pool basis;
- prepares for publication various weekly, monthly and yearly statistical reports on the production and disposition of petroleum and mineral resources;
- provides statistical services to petroleum industry, federal and provincial government bodies, consulting firms, universities and the general public.

Figure 18
Wells Capable of Production



The number of wells capable of production is an accurate indication of the volume of statistics that must be handled by the Petroleum Statistics Branch each month. The past year saw a net addition of 1,943 wells bringing the number of wells capable of production to 24,813 in the province. Of the 1,943 wells added, 991 were gas wells compared to only 751 oil wells. For the first time in 1988, the number of new gas wells that were brought on production exceeded the number of oil wells in the province.

Petroleum statistics are made available in three periodic reports - Drilling Activity Report, Monthly Oil and Gas Production Report and Mineral Statistics Yearbook. Upon request, statistics can also be obtained in a variety of formats and on magnetic tape, microfiche, diskette or printout. In 1988, revenue generated from subscription of periodic reports and the sale of statistics on a request basis totalled in excess of $69,000.

During the 1988-89 fiscal year, the branch devoted much of its time to the development of a new automated Production and Disposition System (PDS) to replace the existing system that was developed in the late 60's and to prepare the system to meet the department's long term goals for data integration. The existing system has been found to be too complex and costly to modify and enhance so that functional and technical inadequacies inherent in the system can be overcome. By fiscal year end, several major tasks were completed under this development project. These included a situation analysis of the existing application, the identification of functional requirements, and the development of a conceptual design for the new PDS. Work also began on detail system design which will be followed by system development, testing, conversion and implementation. The new PDS project is targetted for implementation in early 1990.

As an integral part of this project, the branch also completed an in-depth review of all information and reporting requirements with the view of simplifying the administrative practices for both the industry and the department. The review was undertaken in conjunction with discussions on standardization, which were held amongst task force members from the governments of Alberta, British Columbia and Saskatchewan and various industry associations. As a result of this review and extensive consultation process, an information package including all the revised forms was prepared for final industry comments and feedback.